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PRICES DURING THE WAR

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In at least one field of economic inquiry the maker of predictions may be held responsible statistically. Since the invention of index numbers, any one who has ventured to forecast the movement of prices has taken the chance that later he may be embarrassed by the facts. Frequently during the war, men tried to predict the course of prices by using the Napoleonic period or the Civil War as analogies; or they showed that government price-fixing was futile as long as credit inflation continued. Now that we may look back on what actually happened, it would seem the very beginning of scientific wisdom to check up, to find out where we went wrong, and to get ready for the next prediction.

All the material necessary for such a checking up is found in the report of the inquiry conducted by the Price Section of the War Industries Board.* In fact, the material is so abundant as to discourage the ordinary reader; he will be impressed by the bulk of the fifty-seven bulletins in which the results are published, conclude that it was an important investigation, and decide to read them later. The results include the measurements of the month to month fluctuations in the prices of fifteen hundred commodities belonging to fifty different industries; an exhaustive study of government control over prices; and a comparison of the price movements in the United States with those in thirteen other countries. An inquiry so comprehensive cannot readily be summarized within the limits of a review. The best that can be done is to describe the plan of the inquiry, to indicate some of the ways in which it differs from other investigations into price movements, and to comment briefly on certain of the results.

The feature of the plan which made necessary the collection of so large a number of price quotations was the desire to secure satisfactory samples of prices of both materials and products for each of the fifty industries included in the survey. Merely for the purpose of measuring the change in the general level of prices, a smaller number of commodities might have been sufficient. But if, for example, one wishes to compare the cost of materials in a certain industry with the prices of the products, or to measure the diversity of price change during a general rise, or to explain the fluctuations of controlled and uncon-

* History of Prices During the War. Summary. Wesley C. Mitchell. *War Industries Board Price Bulletins*, No. 1. Washington, Government Printing Office, 1919.

trolled prices, then a longer list of commodities is necessary. In this latter range of problems the present inquiry makes its chief contributions. It is mainly a "statistical study of the internal structure of the system of prices," an attempt to "show how the various groups within the total system of prices have behaved."

"Prices constitute a system in the literal sense that they are so connected as to make a complex whole. To understand the workings of this system at any given time and the change it undergoes from one time to another, it is necessary to trace the interconnections among the various parts of the system. These interconnections are numerous and varied in character. The whole system of prices is not a miscellaneous aggregate of simple commodities, but an organized combination of groups of commodities. The prices of articles within these groups have especially intimate relations with each other and the groups themselves cross each other in rather perplexing ways" (p. 92 of the *Bulletin*). An understanding of the behavior of these various groups is necessary also in order to determine the extent to which a general movement of prices is controlled from within.

The simplest explanations of price movements ordinarily use an oversimplified concept of the price-level. To regard a single series of averages of prices of commodities at wholesale as an index of the "price-level" has the convenience and the dangers of any other oversimplification. Its merit and its defect is that it reduces into a single figure the highly diverse fluctuations of prices, with the advantage that it makes possible the discussion of a general trend of prices and with the disadvantage that the monetary theorist seldom discusses anything else. Only occasionally does he recognize that this apparently simple "price-level" average is in fact the net result of diverse movements within the system of prices. And on those occasions he usually saves himself the necessity of measuring the actual diversity by means of an unverified hypothesis; he assumes, other things remaining equal, that whenever prices in one part of the system rise there must be in some other part of the system a compensating fall.

The study of price movements, however, is wider than the field of monetary theory. It may be convenient to regard the general purchasing power of the dollar as (mathematically) the reciprocal of the price-level, but it does not follow that all the general changes in the level of prices can be attributed (causally) to monetary phenomena. Therefore, without denying the existence or significance of the general movement as measured by the index of the price-level, the statistician also employs various devices which reveal the complexity of the changes taking place within the system.

One measure of the dispersion of prices furnished by this study consists simply in arranging the price quotations on a scale which shows the magnitude of their relatives for each year (p. 12). The purpose of this arrangement is to indicate the diversity of the fluctuations, entirely apart from any question of the character of the commodities. It shows "(1) that the total array of commodities is characterized by a high degree of concentration, (2) that the degree of concentration declines each year, and (3) that the point where most commodities are found moves higher in the scale of relative prices as the war goes on" (p. 21). The tendency of prices to scatter as they rise and to swarm again as they fall has been observed in other studies of price movements made by Professor Mitchell. Apparently there was greater dispersion of prices from 1913 to 1918 than during the Greenback period; prices, on the average, did not rise so high, but they scattered over a wider range. In 1865, when Civil War prices reached their peak, they were more closely massed around the point of densest concentration than were prices in 1918. It is not surprising that the dispersive influence upon prices of a World War which upset many international markets was greater than that of a war in which only the area of the Confederacy was isolated, and the Union States kept their contacts with the rest of the world. Further comparisons should be made between the degree of dispersion during these periods of rapid rise in prices and the more ordinary fluctuations of prices incidental to the business cycle. Such a study might not result in a formula of "normal dispersion," but it should yield some useful observations.

Another device is used to indicate the commodities which fell in price and those that rose the most. It consists of a list for each year of the fifty commodities showing the lowest relative prices and the fifty showing the highest. No very broad conclusions can be drawn from this because the list includes each year only 7 per cent of the entire list of 1,437 commodities. It does show, however, that a considerable number of chemicals kept high in the list throughout the war; that certain important commodities imported from neutral countries, such as rubber and coffee, are among the fifty "lowest"; and that some of the military essentials whose production needed to be stimulated rose to several times their pre-war prices.

This method of listing the highest and lowest touches incidentally on the matter of the price changes in imports and exports. "Imported goods are disproportionately numerous, not only among the articles that rose violently in price but also among those that declined" (p. 16). The reason that many of the important exported articles do not appear also on the list of the "highest" is chiefly because of the brevity

of the list. For it is probable, from what we know of the foreign trade situation, that weighted indexes of the prices of imported and exported articles would show that during the war import prices rose less than the general level, while export prices rose higher than the general level.* Two forces were at work keeping down the prices of imports: first, the imports from Europe, which was the center of disaffection for price revolutions, fell off markedly; and, second, imports of important materials from South America and Asia, which were shut off from some of their former European markets, declined in price and constituted a greatly increased percentage of total imports. Exports, on the other hand, were made up of articles which rose rapidly in price. The expansion of exports before the United States entered the war consisted largely of war goods, whose prices had been bid up by the Allied governments. The extent of this rise is indicated, for example, by the way the index number for the metals group, which includes many exported war materials, ranged above the index for "All Commodities" throughout the period of large exports. For a history of prices during the war there is no topic more important than a study of the influence transmitted to us by our trade with the rest of the world.

The interest in this problem gives point to the comparison made of war prices in various countries. For the purpose of these comparisons special index numbers were constructed measuring the change in identical lists of commodities in each of the two countries compared. The price rise in the United States started later than it did in England or France, rose more slowly, and during the whole period kept to lower levels. An analysis of the causes for these differences will require a great deal of detailed information which can be interpreted only by one familiar with conditions in the countries compared. Even in times of peace, when price fluctuations in different countries tend to correspond, international comparisons are not simple. When the countries are at war and the governments are regulating imports and exports, subsidizing certain industries, and in various ways controlling prices, the complexity is baffling. This study makes a beginning in the analysis and furnishes a considerable part of the material needed for further investigation.

That government price control checked the rise in the general level

* This probability appears to be borne out by the index numbers for imported and exported commodities constructed by the Division of Analysis and Research of the Federal Reserve Board. So far, these index numbers have been constructed only for the years 1913 and 1919, but their position in those years gives some indication of how the prices moved during the war. When completed these new series will be especially valuable in a study of international trade, since they provide import and export price-indexes not only for the United States but also for several foreign countries. See *Federal Reserve Bulletin*, May, 1920. Pp. 499-503.

of prices will not be questioned by those who believe that the control over the prices of basic materials was not necessarily neutralized by a bulge in prices elsewhere. The facts are that the commodities over which the government exercised price control were for the most part the very commodities upon which fell the burden of war demand; that as a group these prices were higher than other prices before the United States entered the war; and that they were very much more affected by the declaration of war than were the others. No doubt, the fact that the prices of the commodities ultimately brought under price control were already high "facilitated the effort to prevent a further advance or even to reduce prices" (p. 43). Yet, without price-fixing, there is no reason why these prices should not have continued to advance and along with them the general level of prices. The truth is, that a year after the first effects of price-fixing were felt—after twelve months of war and of financing by inflation—the price level stood exactly where it was when price-fixing began. Price control, working under the handicap of inflation, accomplished results which somehow must be given recognition by any theory which attempts to account for the price movements of the period.

A summary of the foregoing in the form of a condensed narrative may indicate some of the causal connections. Prices in the United States began rising the middle of 1915, under the influence of large orders for war materials placed by England and France. This demand for export communicated to the United States the rise which had begun earlier over there. When the United States entered the war, prices were 60 per cent above their pre-war level; during the next four months they advanced 20 per cent. From that time until the armistice—sixteen months—the chief factor was price-fixing; the level of prices fluctuated within a comparatively narrow range and at the end was only 6 per cent above the point it had reached when price-fixing began. The causal connection lies partly in the fact that the goods first exported on a large scale were the same commodities that later became essential for winning the war, many of which were ultimately brought under price control. They were of sufficient commercial importance to exercise a dominating influence upon the price-level. Their rise before the entry of the United States into the war, their subsequent abrupt increase, and then their relative stability under regulation, pointed out the direction which the general level of prices tended to follow.

The question of how the Price Section measured these changes in the general level of prices—the method of constructing the "All Com-

modities" index number, remains to be considered. Without going into all the technical details it is desirable to compare this index with the index number compiled by the Bureau of Labor Statistics, for one of the points of interest is the close agreement in the results reached by the two. The question arises whether this agreement furnishes a mutual verification of results independently arrived at, or whether it rests upon similarities of construction.

In the opinion of Professor Mitchell, "the close harmony between the latter [the series compiled by the Price Section and by the Bureau of Labor Statistics] does not arise from similarity of construction. Indeed, the new series includes over four times as many commodities as the old and has a different system of weighting. That independent investigators, utilizing different data, and applying different methods should reach such similar results in a period of such extraordinary changes is one more welcome indication that it is possible to measure the fluctuations of the wholesale price level with substantial accuracy, and also that the more careful the measurements taken the better will they agree" (p. 29).

There are some important respects in which the two index numbers are similarly constructed. Both belong to the same general form of index number—relatives computed from weighted aggregates of actual prices. The method of weighting the separate commodities is not greatly different. The bureau uses the estimated amount of the commodity "entering into trade" in a given year, an estimate which has to be based largely on the figures for production; the Price Section uses production plus imports in the year 1917, apparently because it is the nearest equivalent to the amount "entering into trade" (p. 22).

In addition to these commodity weights, however, the Price Section uses a second set called "class weights." The use of these class weights and the larger number of commodities included in the Price Section Index constitute the main differences in construction. It is important, therefore, to inquire into the influence of these two factors.

The class weights were used in order that the influence exercised by each class upon the "All Commodities" index would be in proportion to their relative importance in the system of prices. That is, in case the weights for the separate commodities threw the scheme of weights out of proportion for purposes of measuring the general trend, the class weights would serve as a corrective. The influence upon the "All Commodities" index of each of the various groups after the class weights were applied is presented in the following table. There is also

presented the influence of the corresponding groups on the Bureau's index number.*

<i>Price Section</i>		<i>Bureau of Labor Statistics</i>	
<i>Groups</i>	<i>Per cent of Influence</i>	<i>Groups</i>	<i>Per cent of Influence</i>
Food.....	45.5	Farm products and food....	52.9
Clothing.....	13.7	Clothing.....	11.6
Metals.....	18.2	Metals.....	9.8
Fuels.....	7.6	Fuel and lighting.....	10.2
Building materials.....	4.2	Lumber and building mate- rials.....	7.7
Chemicals.....	5.6	Drugs and chemicals.....	1.5
Rubber, paper, fibers.....	5.2	Miscellaneous.....	5.9

The agreement in the proportionate influence assigned the various groups by the two methods of weighting is closer than appears on the face of the figures. Some of the differences in percentages are due to differences in classification of certain commodities and not to differences of weighting. Cotton and hides, for example, are placed by the Bureau in the Farm Products group, and by the Price Section in the Clothing group. If these commodities were transferred to correspond to the classification of the Price Section, the agreement of weighting between groups would be closer. Except in the case of the Metals group, the influence exercised by the various groups upon the two different "All Commodities" indexes is quite similar. In both, the aim is to assign to each group a weight which corresponds to the commercial importance of the commodities in the trade of the country—by slightly different methods they arrive at similar results. In fact, it is probable that the class weights bring closer agreement between the two series of index numbers than would exist in their absence.

There are also reasons why the 1,437 "commodities" carried by the Price Section as against the 309 carried by the Bureau (in the year 1917) result in only small divergences between the two series. In the first place, all the commodities quoted by the Bureau are also carried by the Price Section. These include all the leading raw materials which, because of their commercial importance, are assigned a very large percentage of the weighting in both series. Also, many

* The percentages given for the Bureau of Labor are for the year 1917, because that year is used by the Price Section as a base year for weighting. In the comparison, the following adjustments are made: (1) The Bureau's groups of Farm Products and of Food are combined and compared to the Price Section's group of Food; (2) the group of Miscellaneous is compared to the group of Rubber, Paper and Fibers because they contain many of the same commodities—rubber, paper, wood-pulp, jute and rope are in both and carry the larger part of the weighting—(3) the Bureau's group of House-furnishings is omitted altogether, because there is no corresponding group in the Price Section index; in the Bureau's scheme of weights it counts for only four-tenths of 1 per cent.

of the additional commodities are in classes which are commercially of less importance. The Price Section quotes, for example, 281 chemicals, 20 per cent of the total commodities carried, while the Bureau quotes only 18; but the influence of the chemicals in either case on the "All Commodities" index is limited by the small percentage of weight assigned it by the scheme of weighting. Furthermore, the larger number of commodities is partly explained by the fact that in many instances the Price Section carried a large number of price series for almost the same commercial product. In hides and skins, for example, the Price Section has 48 quotations and the Bureau only 3; in leather, the Price Section has 51 and the Bureau 4. Bituminous coal, for which the Bureau carries 3 quotations, counts in the Price Section as "15 distinct commodities each of which is represented by its own series of prices" (p. 4). This full representation of different grades and markets is indispensable for a complete study of prices in the industry concerned, which was the main purpose of the Price Section; but their inclusion as additional commodities could hardly be expected to exercise any considerable influence on the index for "All Commodities."

The conclusion, then, to be drawn from this comparison is that the Price Section index number is constructed along lines sufficiently similar to those of the Bureau of Labor Statistics, so that their agreement in results cannot be regarded as furnishing independent verification. It is perhaps unnecessary to add that the two series are the best index numbers yet constructed, and that independent verification is not necessary in order that one may have confidence in them both:

Both series, however, still leave something to be desired. In fact, the agreement between the two is partly due to a shortcoming common to them both. Both series probably overstate the degree of fluctuation in the general level of prices. This is due to their under-valuation of the importance of manufactured goods in the system of prices. This difficulty cannot be avoided at present by gathering additional quotations, because the information concerning the prices of these goods is not available. But one of the functions of a system of weights is to overcome if possible such unavoidable shortages in quotations.

The class weights used by the Price Section do not accomplish this because the weight is applied to the price aggregates for the whole class, without distinguishing between the raw materials and manufactured goods. In establishing the class weights, allowances were made for "the value added by manufacture," thus tending to increase the relative importance of those classes composed largely of manufactured commodities. But the class weights did not increase the importance of manufactured goods *within* the class, or give to the prices

of those goods any separate or special influence on the index for "All Commodities."

Special index numbers for manufactured goods were constructed for a number of different industries and published in the class bulletins. They show that the prices of manufactured goods fluctuated within a narrower range than the prices of raw materials. It is probable, therefore, that if a scheme of weights were used that gave to manufactured goods the importance they deserve, that the index number would show a less marked increase. We cannot now measure the precise degree of this exaggeration, but it is desirable to make allowance for the fact when discussing problems of general price change. The inclusion of a large number of heavily weighted raw materials may have the advantage of making index numbers more sensitive barometers. It also has the disadvantage of overstating the actual range of fluctuation.

Improvements in the methods for measuring the general change in prices is only one, and perhaps not the most important, of the still unsolved statistical problems concerning price fluctuations. Professor Mitchell in closing his Summary gives a list of topics requiring further investigation. The inquiry by the Price Section has succeeded in making "two problems grow where one grew before," and it has furnished the statistical material necessary for working on both problems. Any one interested in the study of price movements should see to it that he has the whole set of 57 bulletins. They will stand as the fullest collection of information about prices for a period which is unequalled in the complexity of the causes influencing price fluctuations.